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IS 11733 (1986): Specification for steel wedge gate globe and check valves for petroleum, perochemical and allied industries (nominal size 50 mm and smaller) [MED 17: Chemical Engineering Plants and Related Equipment]

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IS : 11733-1986

(Reaffirmed 2003)

Indian Standard

SPECIFICATION FOR STEEL WEDGE GATE, GLOBE AND CHECK VALVES FOR PETROLEUM, PETROCHEMICAL AND ALLIED INDUSTRIES (NOMINAL SIZE 50 mm AND SMALLER)

1. Scope — Specifies the requirements for forged, cast or bar stock steel wedge gate, globe, stop and check valves with flanged, screwed, socket-weld or butt-weld ends.

1.1 It covers the valves in nominal sizes DN 6 to DN 50 and class designations:

150, 300, 600, 800 and 1 500.

2. Terminology and Definitions — For the purpose of this standard the terminology and definitions given in IS : 4854 (Part 1)-1969 'Glossary of terms for valves and their parts: Part 1 Screw down stop, check and gate valves and their parts', are generally applicable.

3. Types — Valves shall be one of the following types.

3.1 *Wedge Gate Valves*

3.1.1 Valves with outside screw and yoke type, rising stem, bolted or welded bonnet and bolted gland:

a) Reduced bore (class 800 only).

b) Standard bore (for all other sizes).

3.1.2 Valves with inside screw rising stem and handwheel, bolted or welded bonnet and gland nut, for use at temperatures up to 425°C only, and with screwed and socket-weld ends (for classes 800 and 1 500 only):

a) Reduced bore (class 800 only).

b) Standard bore.

3.2 *Globe Stop Valve and Screw Down Non-return Valve* (*Straight, Angle or Oblique Pattern*)

3.2.1 Valves with outside screw and yoke type, rising stem and handwheel bolted or welded bonnet, flat faced or plug or needle type disc as shown in Fig. 1:

a) Reduced bore (except class 1 500).

b) Standard bore.

3.2.2 Valves with inside screw, rising stem and handwheel, bolted or welded bonnet, gland nut and plug or needle type disc, for use at temperatures up to 425°C only, and with screwed and socket-weld ends (for class 800 and 1 500 only) as shown in Fig. 2:

a) Reduced bore (class 800 only).

b) Standard bore.

3.3 *Check Valve* (*Straight or Angle*) — These valves shall be with bolted or welded cover:

a) Reduced bore (except class 1 500).

b) Standard bore.

3.3.1 Check valves of the following patterns are covered in this standard:

a) Piston type (for angle or horizontal flow) as shown in Fig. 3.

b) Ball type (for angle or horizontal flow) as shown in Fig. 4.

c) Ball type (for vertical flow) as shown in Fig. 5.

Industrial Valves Sectional Committee, EDC 81 [Ref : Doc : EDC 81(4038)]

Adopted 14 July 1986

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Gr 7

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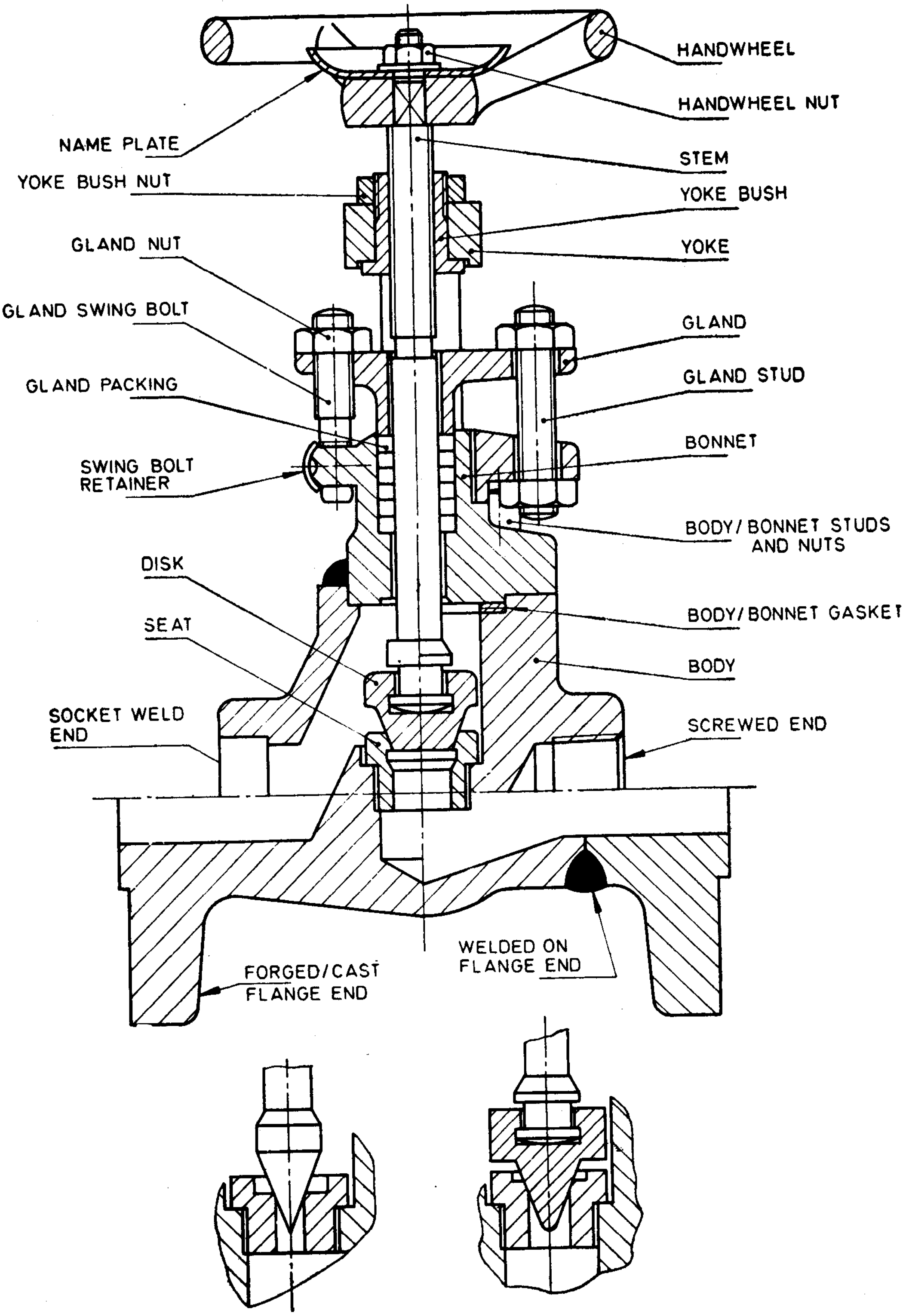

FIG. 1 TYPICAL GLOBE VALVE (OUTSIDE SCREW)

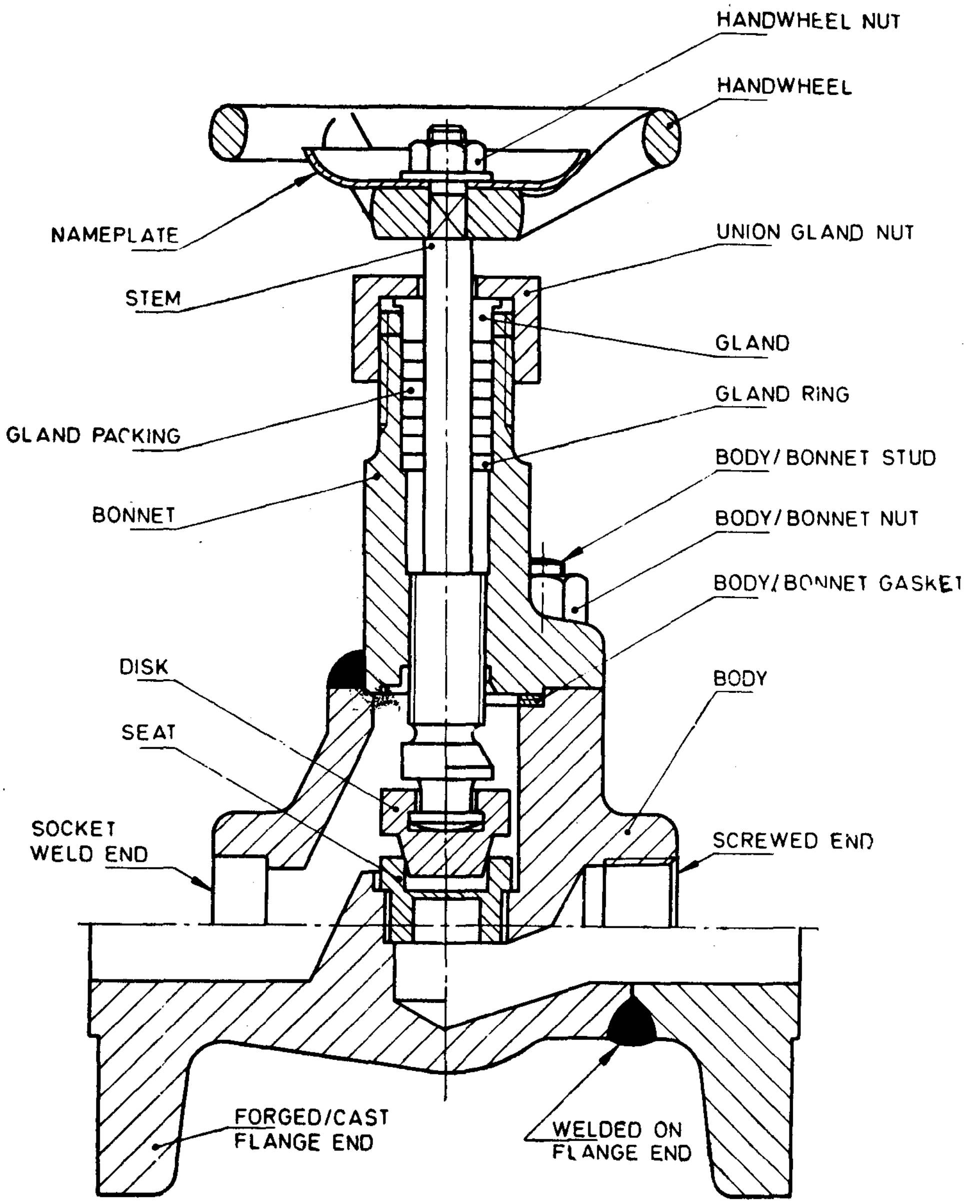

FIG. 2 TYPICAL GLOBE VALVE (INSIDE SCREW)

3.4 *Bellows-Sealed Valves*

3.4.1 Wedge gate valves of outside screw and yoke type, rising stem, bolted or welded bonnet and bolted gland as shown in Fig. 6:

a) Reduced bore (except class 1 500).

b) Standard bore.

3.4.2 Globe valves (straight, angle or oblique pattern) of outside screw and yoke type, rising stem and handwheel, bolted or welded bonnet, flat or plug or needle type disc:

a) Reduced bore (except class 1 500).

b) Standard bore.

4. End Types — Table 1 specifies the types of ends available for each class and size of valve covered in this standard.

5. Pressure/Temperature Ratings

5.1 Maximum permissible gauge working pressures and temperatures applicable to valves covered by this standard shall be in accordance with 'Indian Standard Specification for steel pipe flanges and flanged fittings' (*under preparation*) for respective shell materials. Each pressure rating is the maximum allowable pressure at the corresponding tabulated temperatures. Pressure/temperature ratings for class 800 valves shall be as given in Table 2.

TABLE 1 END TYPE AVAILABILITY ACCORDING TO CLASS AND SIZE OF VALVE

(*Clause* 4)

Nominal Size DN	Class				
	150	300	600	800	1 500
6	—	—	—	B —	— — —
10	—	—	—	B —	— — —
15	A	A	A	B.C	A.B.C
20	A	A	A	B.C	A.B.C
25	A	A	A	B.C	A.B.C
32	A	A	A	B.C	A.B.C
40	A	A	A	B.C	A.B.C
50	A	A	A	B.C	A.B.C

Note — A denotes flanged ends and butt-weld ends.
B denotes screwed ends.
C denotes socket-weld ends.

5.2 Pressure/temperature ratings for bellows-seal valves shall be as in Table 3 when the body rating is in excess of the values given in Table 2. For valves with lower body rating, the values specified in Table 3 shall not apply.

5.3 Pressure/temperature ratings may be interpolated between pressure/temperatures tabulated for intermediate service conditions.

5.4 Restrictions on ratings may be placed by the manufacturer on the valves in accordance with this standard by reason of trim material and other factors.

6. Design and Manufacture

6.1 *Body*

6.1.1 With the exception of pipe ends, the minimum body thickness at any point shall not be less than the values given in Table 4. Drilling or pinning for fixing name plates, etc, shall not reduce the body thickness below the minimum specified value.

6.1.2 The design of valve bodies shall be such as will provide ample resistance to distortion under the maximum cold working pressure and under the specified pressure at the maximum temperatures. The body shall be designed to minimize pressure loss as well as corrosive and erosive effects.

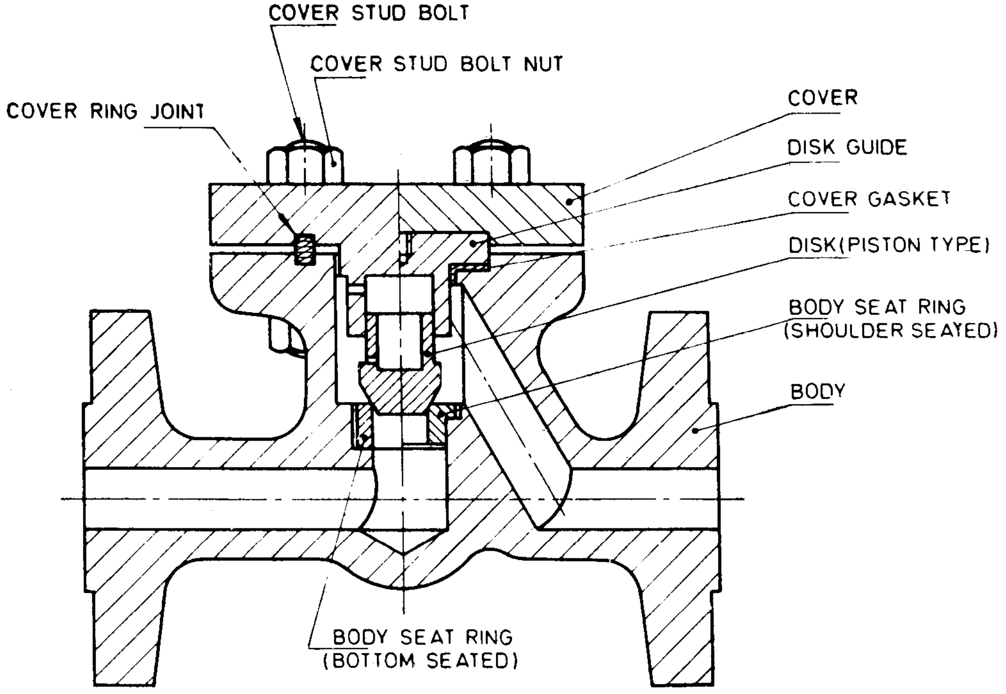

FIG. 3 PISTON TYPE CHECK VALVE

TABLE 2 PRESSURE/TEMPERATURE RATINGS FOR CLASS 800 SCREWED AND SOCKET-WELD END VALVES

(*Clauses* 5.1 *and* 5.2)

Service Temperature	Maximum Non-shock Service Pressure Rating		
	Carbon Steel	1¼ Percent Chromium 1/2 Percent Molybdenum Steel	5 Percent Chromium 1/2 Percent Molybdenum Steel
°C	bar*	bar*	bar*
−30 to 38	138	138	138
50	137	137	137
75	135	135	135
100	133	133	133
125	132	132	132
150	130	130	130
175	129	129	129
200	128	128	128
225	125	125	125
250	122	122	122
275	116	116	116
300	110	110	110
325	103	103	103
350	97	97	97
375	89	91	91
400	81	86	86
425	71	80	80
450	59	74	74
454	55†	73	73
475	47	68	68
500	34	63	63
525	22	55†	55†
540	15	50	50

Note 1 — The above pressure/temperature ratings are the minimum requirement and valves having ratings in excess of these may be obtained from individual manufacturers.

Note 2 — The use of valves at temperatures where the creep strength might be the limiting criterion is subject to the establishment of a design life.

*1 bar = $10^5 N/mm^2$ = 100 kPa.

†Primary service pressure.

TABLE 3 PRESSURE/TEMPERATURE RATINGS FOR BELLOWS-SEAL VALVES

(*Clauses* 5.2 *and* 9.1)

Service Temperature	Maximum Non-shock Service Pressure Rating	Test Pressure	
		Body	Seat
°C	bar	bar	bar
−30 to 38	99	150	103
50	98		
75	97		
100	96		
125	95		
150	94		
175	93		
200	91		
225	90		
250	87		
275	83		
300	79		
325	75		
350	71		
375	67		
400	63		
425	59		
450	55		
454	55*		
475	47		
500	34		
525	22		
540	15		

Note 1 — The above pressure/temperature ratings apply to the bellows sealing element and are a minimum requirement for valves complying with this standard; bellows ratings higher than the values listed above may be obtainable from individual manufacturers who should be consulted as to the maximum pressure/temperature ratings applicable to their particular product.

Note 2 — The use of valves at temperatures where the creep strength might be the limiting criteria is subject to the establishment of a design life.

*Primary service pressure.

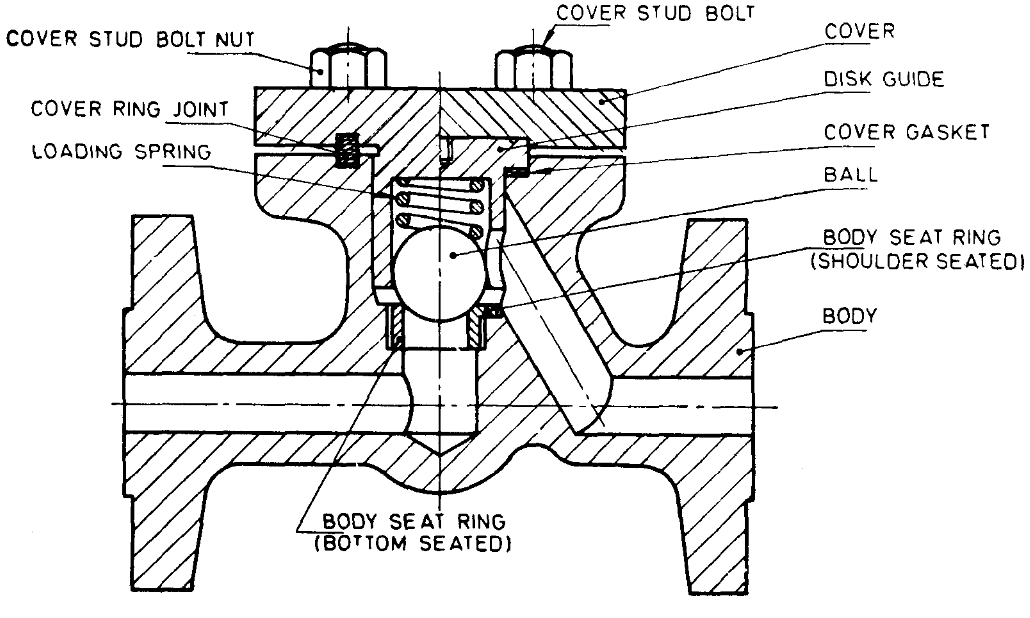

FIG. 4 BALL TYPE CHECK VALVE FOR HORIZONTAL FLOW

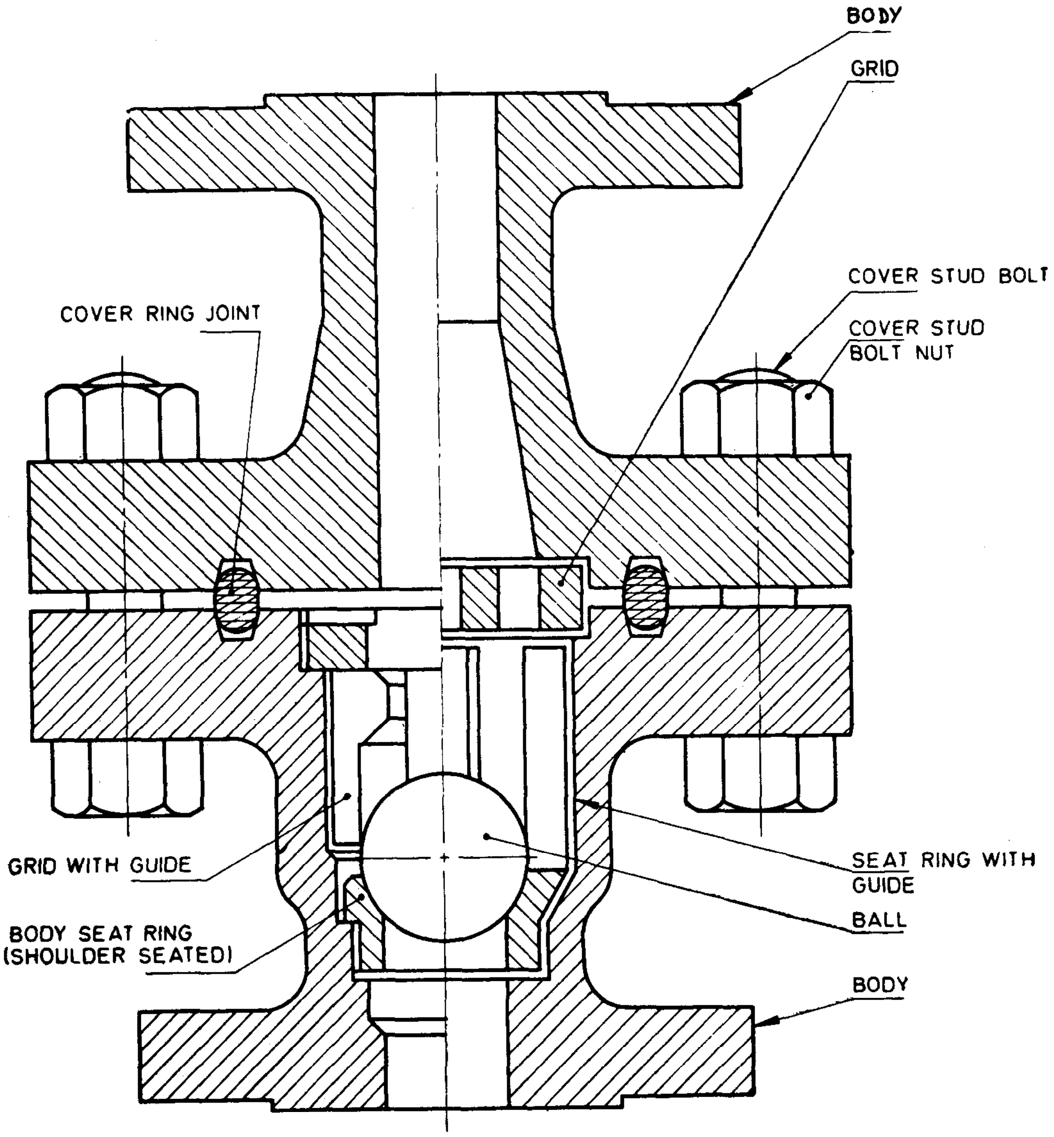

FIG. 5 BALL TYPE CHECK VALVE FOR VERTICAL OR HORIZONTAL FLOW

6.1.3 The body end ports shall be circular. The port diameter and seat bore shall comply with the values specified in Table 5.

TABLE 4 MINIMUM BODY AND BONNET WALL THICKNESS (EXCLUDING PIPE ENDS)

(*Clauses* 6.1.1 *and* 6.2)

Nominal Size DN	Minimum Body and Bonnet Wall Thickness		
	Classes 150, 300, 600 and 800		Class 1 500 Standard Bore
	Standard bore	Reduced bore	
	mm	mm	mm
6	3·3	3·0	—
10	4·1	3·3	—
15	4·8	4·1	5·2
20	5·6	4·8	6·1
25	5·8	5·6	6·7
32	6·1	5·8	7·5
40	7·1	6·1	7·8
50	7·5	7·1	8·6

TABLE 5 MINIMUM PORT DIAMETER AND SEAT BORE

(*Clauses* 6.1.3 *and* 6.1.11)

Nominal Size DN	Minimum Port Diameter and Seat Bore						
	Globe Needle Valve	Classes 150, 300, 600 and 800				Class 1 500	
		Wedge gate valve		Globe and check valve		Wedge gate valve	Globe and check valve
		Standard Bore	*Reduced Bore*	*Standard Bore*	*Reduced Bore*	*Standard Bore*	*Standard Bore*
	mm	mm	mm	mm	mm	mm	mm
6	3·0	6·0	—	6·0	—	—	—
10	3·0	9·0	6·0	9·0	6·0	—	—
15	5·0	12·0	9·0	12·0	9·0	11·5	11·0
20	6·5	18·0	12·0	17·5	12·0	15·0	14·5
25	8·5	23·0	18·0	22·5	17·5	19·5	19·0
32	11·0	30·0	23·0	29·5	22·5	28·0	27·0
40	15·0	36·0	30·0	35·0	29·5	32·0	31·0
50	18·5	46·5	36·0	45·5	35·0	40·0	37·5

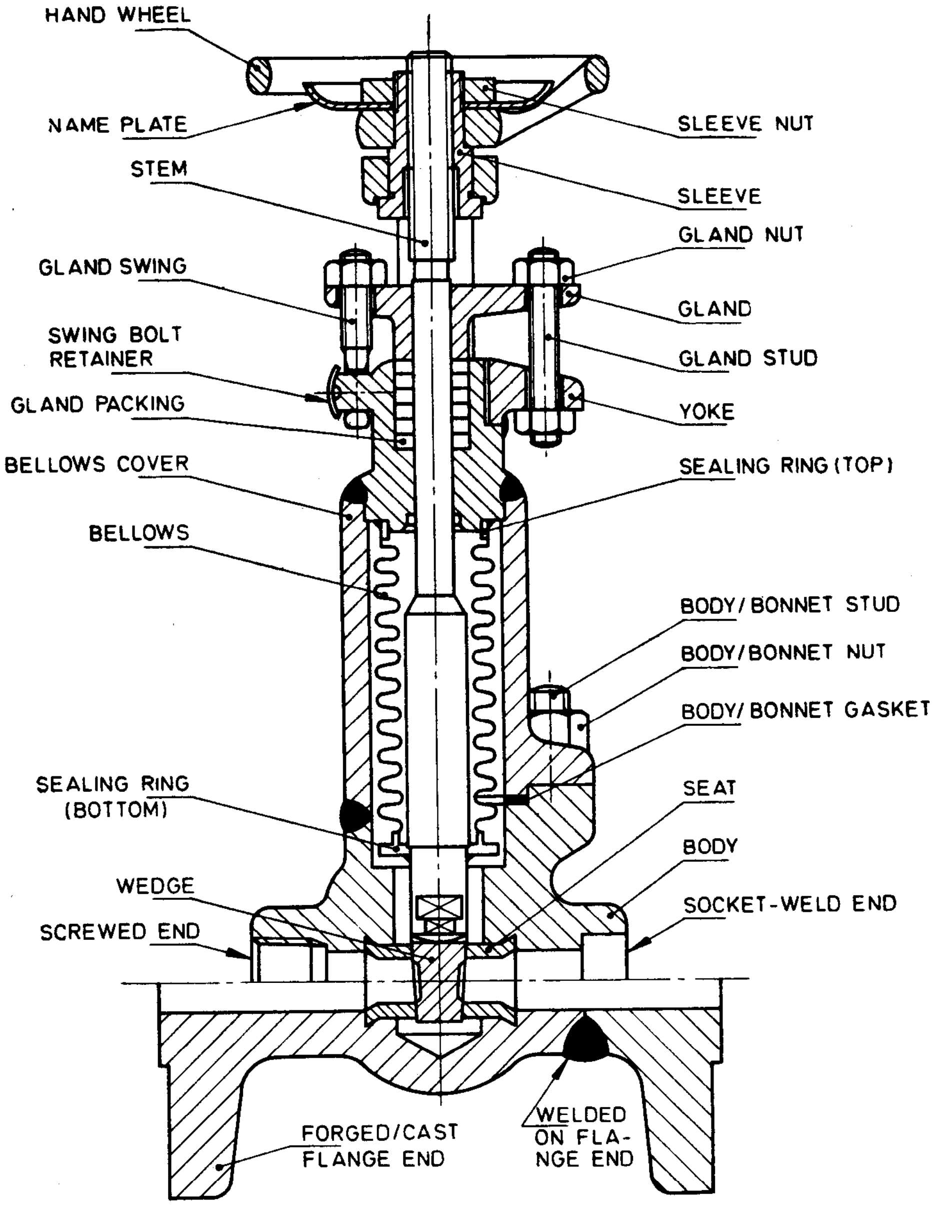

FIG. 6 TYPICAL BELLOWS-SEAL WEDGE GATE VALVE

6.1.4 Face-to-face and centre-to-face dimensions for raised face flanged end valves and end-to-end and centre-to-end dimensions for butt-welding end and ring joint flanged end valves shall conform to the dimensions given in IS : 9884-1981 'Dimensions for ferrous valves—face-to-face and end-to-end'.

6.1.5 End flanges shall be machined, spot faced or back faced according to 'Indian Standard Specification for steel pipe flanges and flanged fittings' (*under preparation*), for the facings specified in the purchase order. When nothing particular is specified by the purchaser, the flanges shall be supplied drilled and bolt holes shall be 'off centre'.

If any other flange dimensions are required by the purchaser, the same shall be specified in the purchase order and shall mutually be agreed by the supplier and the purchaser.

6.1.6 The flanged end valves may have flanges integral with or welded to the body. End flanges attached by welding shall be butt-welding type and welds, including qualifications of welding procedure and welding operator shall be as specified in IS : 2825-1969 'Code for unfired pressure vessels'.

Flange attachment by other welding processes shall be the subject of agreement between the manufacturer and the purchaser.

6.1.7 For butt-welded end valves, the ends shall be circular and integral with the body. The butt-weld ends shall conform to 'Indian Standard Specification for butt welding ends' (*under preparation*).

6.1.8 The ends of screwed end valves may be circular or hexagonal. The threads shall be according to IS : 3333 'Dimensions for petroleum industry pipe threads'. Other forms of threads may be provided as specified by the purchaser.

6.1.9 Socket weld end valves shall have circular ends and end faces machined square to the axis. Socket details shall comply with the requirements of IS : 4712-1984 'Specification for forged steel socket welding fittings (*first revision*)'.

6.1.10 The minimum outside diameter or dimensions across flats of body ends shall be as in Table 6.

6.1.11 The body and end ports shall be circular. The port diameter and seat bore shall comply with valves specified in Table 5.

TABLE 6 MINIMUM OUTSIDE DIAMETER OR DIMENSION ACROSS FLATS OF BODY ENDS

(*Clause* 6.1.10)

Nominal Size DN	Minimum Outside Diameter or Dimension Across Flats of Body Ends	
	Class 800	Class 1 500
	mm	mm
6	22	—
10	25	—
15	32	38
20	38	45
25	45	55
32	55	62
40	62	75
50	75	80

6.2 *Bonnet/Cover* — The minimum wall thickness of bonnet or cover at any point shall not be less than the values specified in Table 4. The mating flanges between the body and bonnet/cover shall be sufficiently thick to provide leak proof joint when the valve is operated continuously under the maximum working pressure.

6.3 *Body to Bonnet/Cover Joint* — The body to bonnet/cover joint shall be either welded or secured by a minimum of four studs or stud bolts and no bolting shall be less than 10 mm diameter. Cap screws may be provided subject to agreement between the purchaser and the supplier.

Total root cross-sectional area of stud bolts shall be sufficient to produce a stress not exceeding 62 MPa at the root of thread, by a pressure equal to the nominal pressure rating acting on the area bounded by the effective outside periphery (for a ring joint, use pitch circle) of the gasket.

6.4 *Back Seat* — Globe, stop, screw down non-return and gate valves shall be provided with back seat face in the bonnet which contacts a corresponding seating surface on stem or disc nut. The back seat may also be weld deposited on the bonnet with suitable hard facing material. The weld deposit shall have a minimum thickness of 1·6 mm in the finished condition. The back seat face shall be machined conical, spherical or flat.

6.5 *Stem and Stem Nut/Yoke Bush*

6.5.1 The minimum stem diameter, measured where it passes through the packing, shall be as specified in Table 7.

TABLE 7 MINIMUM STEM DIAMETER FOR WEDGE GATE VALVES AND GLOBE VALVES

Nominal Size DN	Minimum Stem Diameter					
	Gate Valves			Globe Valves		
	Classes 150, 300, 600 and 800		Class 1 500 Standard Bore	Classes 150, 300, 600 and 800		Class 1 500 Standard Bore
	Standard Bore	*Reduced Bore*		*Standard Bore*	*Reduced Bore*	
	mm	mm	mm	mm	mm	mm
6	7·0	7·0	—	8·0	8·0	—
10	8·5	7·0	—	9·5	8·0	—
15	9·5	8·5	12·5	11·0	9·5	12·5
20	11·0	9·5	14·5	12·5	11·0	16·0
25	12·5	11·0	16·0	14·5	12·5	16·0
32	14·5	12·5	17·5	16·0	14·5	19·0
40	16·0	14·5	19·0	19·0	16·0	19·0
50	19·0	16·0	20·5	19·0	19·0	20·5

6.5.2 Stem and wedge connection of gate valve shall be flexible to allow proper seating and for this purpose stem shall have an integral end in the form of teehead, which will fit into a slot at the top of wedge and this will eliminate the possibility of the wedge leaving the stem or rotation of the stem in the wedge during service. Threaded or pin connections are not permissible.

6.5.3 The design of stem disc attachment in globe valves shall be such that disc articulate to ensure correct alignment and proper seating and may not be detached in service. Retention shall be by an effective method.

6.5.4 Stems of needle valves shall have integral disc or shall be such that its disc can articulate to ensure correct alignment with the seat.

6.5.5 The stem of gate and globe valves shall be of adequate length to ensure that the handwheel stands well clear of the yoke when the valve is in worm closed position.

6.5.6 The threads of the stem and stem nut/yoke bush shall be acme or stub acme type. Alternatively, the threads may be trapezoidal type according to IS : 7008-1973 'ISO metric trapezoidal screw threads'.

6.5.7 The stem shall be ground finished to prevent damage to packing during operation.

6.6 *Body Seat*

6.6.1 Austenitic steel valves and valves with hard faced seats may have body seat integral or directly deposited on the body. The austenitic or hard facing seat material deposit on body shall have minimum thickness of 1·6 mm in the finished condition.

Otherwise the body seat rings shall be of renewable type. The seat rings shall be either screwed or rolled and shall be either shoulder seated or bottom seated. Threaded rings shall be designed to facilitate removal. Body seat rings shall be so fitted as to avoid their becoming loose in service. The seat ring faces shall be finished smooth. The edges of the seating surface shall be chamfered to prevent scoring of disc.

6.6.2 The hardness of seat rings in case of 13 percent Cr material shall be 250 HB minimum. In other case, the hardness shall be according to manufacturer's standard.

6.7 *Wedge, Disc, Disc Nut, Piston and Ball*

6.7.1 The wedge of the wedge gate valve shall be of the solid type with integral or deposited faces. The sharp outer edges of the seat surfaces shall be removed to prevent scoring of the body seating surfaces.

The width of the body seat and wedge seating surface shall be so proportioned that the wedge sits high on the body seat and remains in contact with the full effective seating width of the body even after the wedge has travelled down by a distance (wear travel) not less than the following:

Nominal Seat Bore Size	Minimum Wear Travel
mm	mm
6	1
10	1
15	1
20	1
25	1·5
32	1·5
40	2
50	2

6.7.2 The disc of globe valve shall be of either:

a) flat faced type, or

b) plug type, or

c) if specified by the purchaser, the needle point type, either loose or integral with the stem.

6.7.3 When assembled the disc shall freely rotate on spindle to allow for proper seating except in case of integral needle type disc.

6.7.4 The disc may have integral faces or may be fitted with separate facing rings firmly secured to the disc or directly weld deposited.

6.7.5 Directly deposited facings shall have minimum thickness of 1·6 mm in the finished condition.

6.7.6 The hardness of seating surface shall be minimum 250 HB in case of 13 percent Cr material. In other cases, hardness shall be as per manufacturer's standard.

6.7.7 In fully open position, the flow way area between disc and seat shall be at least equal to the net flow way area through the body seat.

6.7.8 In case of check valves having piston type disc, disc shall be in the form of a cylinder, the lower end of which is shaped to form seating face which may be flat or plug type. Disc shall fit into a guide to make an effective dashpot and for this purpose shall be provided with a bleed hole of proper size near the seating disc or in the piston guide.

6.7.9 In ball check valves, the ball shall be constrained in the guide in such a manner that at the top end of travel of the ball a cushioning effect is obtained.

6.7.10 In ball check valve also the area between ball and the seat in the fully opened position shall be at least equal to the net area through the seat.

6.8 *Stuffing Box and Packing*

6.8.1 The stuffing box shall be integral and to be machined smooth.

6.8.2 The stuffing box diameter and stem diameter shall be such as to accommodate packing size given in Table 8.

The depth of stuffing box shall be not less than six times the nominal packing width specified in Table 8.

TABLE 8 PACKING AND STUFFING BOX DIMENSIONS

Nominal Stem Diameter	Nominal Packing Width
mm	mm
7·0 up to and including 9·5	2·5
Above 9·5 up to and including 12·5	3·0
Above 12·5 up to and including 19·0	5·0
Above 19·0	6·0

6.9 *Yoke, Yoke Sleeve and Yoke Bush*

6.9.1 The yoke shall be integral with or separate from the bonnet.

6.9.2 The yoke sleeve on wedge gate valves shall be machine finished on all contact surfaces.

6.9.3 The yoke bush on globe valve shall be screwed or otherwise fixed with the yoke and locked in position.

6.10 *Gland*

6.10.1 The gland shall be of two-piece design consisting of gland flange and gland follower and shall be of self aligning type.

6.10.2 Complete entry of gland follower into the stuffing box shall be prevented by providing a shoulder at its outer end.

6.10.3 Gland flange shall have two holes for gland bolts and not slots.

6.10.4 The gland bolting shall be either of:

a) hinged bolts secured by either a headed bolt passed through the eye and secured by a headed nut or a pin passed through the eye and effectively secured.

b) stud bolt passed through a plain hole in the flange on the bonnet and secured to the flange by two nuts or stud bolts screwed into a tapped hole in the flange on the bonnet and secured by a lock nut.

c) headed bolt passed through a plain hole in the flange on the bonnet and secured by a nut.

d) swing bolt having an integral eye mounted on a trunion and properly secured.

6.11 *Bellows-Seal*

Except for the teehead or button, the whole of the stem, back seating arrangement and stem packing shall be isolated from the line medium by a flexible metallic bellows.

The bellows shall be attached to the bottom end of the stem and the body or bonnet by welding. Globe valve stems shall be prevented from rotating by provision of a spline or similar arrangement.

The design of the bellows and attachment shall be such that the valve head assembly is capable of a minimum cycle life of 10 000 cycles for globe valves and 2 000 cycles for wedge gate valves where one cycle is specified as fully open to fully closed to fully open. The suitability of the bellows assembly design shall be demonstrated by means of prototype tests upon representative samples in accordance with **10.2**.

6.12 *Bolting*

6.12.1 The body and bonnet flange bolting and the bolting for separate yokes shall conform to IS : 1364'Specification for hexagon head bolts, screws and nuts of product grades A and B'. The bolting for body and bonnet shall have coarse pitches of screwed threads specified in IS : 4218 'ISO metric screw threads .

6.12.2 Threading of the gland bolting shall conform to IS : 4218.

6.12.3 The bolting shall be supplied in parkerised, phosphatised or in any other rust-proofed surface condition.

6.13 *Handwheel and Handwheel Nut*

6.13.1 Handwheel shall be of spoke and rim design and may have knobs or studs projecting beyond the rims for effective grip.

6.13.2 Handwheel shall be fixed on yoke sleeve/stem by suitable sleeve/stem nut so as to eliminate possibility of loosening in service.

6.13.3 Handwheel shall be marked with an arrow and shall have on it the word 'OPEN' or 'SHUT' to indicate the operating direction of rotation of the valve, unless the wheel size makes it impracticable.

6.13.4 Valve shall be opened by turning the handwheel in anticlockwise direction.

6.14 *Interchangeability of Components*

Valve components shall be designed and manufacturing tolerances set, to allow interchangeability of parts between units of same size, class and type from any one manufacturer.

7. Materials

7.1 *Body and Bonnet*

7.1.1 The material of the body and bonnet, depending on service conditions, shall as far as possible be selected from the list of materials specified in Table 9.

7.1.2 Any material other than that specified in Table 9, if required, shall be stated in the purchase order and may be supplied subject to agreement between the purchaser and the manufacturer.

7.2 *Trim*

7.2.1 Trim comprises the following:

a) Stem,

b) Body seat surfaces,

c) Wedge/disc/piston/ball seating surfaces,

d) Disc nut, and

e) Back seat bushing.

7.2.2 Standard trim materials shall be of the general composition as specified in Table 10. Other trim materials are permitted by agreement between the manufacturer and the purchaser.

TABLE 9 BODY AND BONNET MATERIAL

(*Clauses* 7.1.1 *and* 7.1.2)

	Material	Steel Designation	Reference to IS :
CASTINGS	Carbon steel	Gr 2	2856-1979
	Carbon steel (low temperature)	25 C 8	1570-1979
	1/2 Mo steel (low temperature)	Gr 4	4899-1976
	1 Cr 1/2 Mo steel	Gr 4	3038-1974
	2¼ Cr 1 Mo steel	Gr 5	3038-1974
	5 Cr 1/2 Mo steel	Gr 6	3038-1974
	18 Cr-8 Ni	Gr 6	7806-1975
	18 Cr-10 Ni 2 Mo	Gr 9	7806-1975
	18 Cr-8 Ni-Nb	Gr 7	7806-1975
	Carpenter alloy	Gr 15	3444-1978
	3½ Ni steel	Gr 3	4899-1976
FORGINGS	Carbon steel	Gr 3	2004-1978
	Carbon steel (low temperature)	15 C 8	1570-1979
	1 Cr 1/2 Mo steel	15 Cr 70 Mo 55	2611-1964
	2¼ Cr 1 Mo steel	10 Cr 2 Mo 1	1570-1979
	5 Cr 1/2 Mo steel	20 Cr 5 Mo 55	1570-1979
	3½ percent Ni steel	15 Ni 14 Cr 3 Mo 2	1570-1979
	18 Cr-8 Ni	04 Cr 19 Ni 9	1570-1979
	18 Cr-8 Ni-2 Mo	05 Cr 19 Ni 11 Mo 2	1570-1979
	18 Cr-8 Ni-Nb	04 Cr 19 Ni 9 Nb 40	1570-1979
	18 Cr-8 Ni-Ti	04 Cr 19 Ni 9 Ti 20	1570-1979

Note 1 — Material used shall be subjected to heat treatment procedure required by the corresponding material specification.

Note 2 — A comparative study of the ASTM and BS standards equivalent to the grades are given in Appendix A for information.

7.2.3 The stem shall be of wrought material and the minimum hardness of stem shall be 200 HB in case of 13 percent Cr material.

7.2.4 The minimum hardness of back seat bushing shall be 250 HB in case of 13 percent Cr material.

7.2.5 Hardness differential of 50 HB is required between the body and wedge or disc or piston or ball seating surfaces if both are 13 percent Cr.

7.3 *Wedge, Disc, Piston or Ball*

The wedge, disc, piston or ball shall have either integral or weld deposited seating surfaces. Any component with material different from its seating face and also its guides shall be of a material at least equal to that of the shell.

Disc-retaining nuts and grid plates shall be of a material not inferior to that of the normal trim.

7.4 *Yoke* — Any yoke separate from the bonnet shall be of carbon steel.

7.5 *Yoke Bush/Sleeves* — Yoke bush/sleeve shall be of ductile nodular 'Ni' resist having a suitable bearing quality and a minimum melting point above 953°C in accordance with Grade ASG Ni 20 Cr 2 of IS : 2749-1974 'Specification for austenitic iron castings (*first revision*)'. Any other material shall be subject to agreement between the purchaser and the manufacturer.

7.6 *Gland Flange and Gland Follower*

7.6.1 The material of the gland flange shall be steel (cast, rolled or forged). Carbon steel shall be supplied in rust-proofed condition.

7.6.2 Gland follower shall be made of a material having a melting point above 955°C.

7.7 *Packing* — The packing supplied with the valve shall be suitable for the pressure/temperature rating of the valve.

TABLE 10 TRIM MATERIALS

(*Clause* 7.2.2)

Trim Symbol	Material Type			Minimum Brinell Hardness			Acceptable Material Specification		
	Seat Surface	Stem	Back Seat Bushing (2)	Seat Surface	Stem	Back Seat Bushing	Cast (*see* Note 1)	Forged	Bar
CR 13	13 Cr	13 Cr	13 Cr	(3)	200	250	Gr 1 IS : 7806-1975	12 Cr 13 IS : 1570 (Part 5)-1972	12 Cr 13 IS : 6603-1972
18-8 Ti	18-8 Cr-Ni-Ti	18-8 Cr-Ni-Ti	18-8 Cr-Ni-Ti	Manufacturer's Standard			Gr 5A IS : 7806-1975	04Cr18Ni10Ti20 IS : 1570 (Part 5)-1972	04Cr18Ni10Ti20 IS : 6603-1972
18-8 Nb	18-8 Cr-Ni-Nb	18-8 Cr-Ni-Nb	18-8 Cr-Ni-Nb	Manufacturer's Standard			Gr 5A IS : 7806-1975	04Cr18Ni10Nb40 IS : 1570 (Part 5)-1972	04Cr18Ni10Nb40 IS : 6603-1972
18-10-2	18-10-2 Cr-Ni-Mo	18-10-2 Cr-Ni-Mo	18-10-2 Cr-Ni-Mo	Manufacturer's Standard			Gr 5 IS : 7806-1975	04Cr17Ni12Mo2 IS : 1570 (Part 5)-1972	04Cr17Ni12Mo2 IS : 6603-1972
18-12-3	18-12-3 Cr-Ni-Mo	18-12-3 Cr-Ni-Mo	18-12-3 Cr-Ni-Mo	Manufacturer's Standard			Gr 5 IS : 7806-1975	04Cr17Ni12Mo2 IS : 1570 (Part 5)-1972	04Cr17Ni12Mo2 IS : 6603-1972
25-20	25-20 Cr-Ni	25-20 Cr-Ni	25-20 Cr-Ni	Manufacturer's Standard			Gr 9 IS : 7806-1975	20Cr25Ni20 IS : 1570 (Part 5)-1972	20Cr25Ni20 IS : 1570 (Part 5)-1972
HF (Hard faced)	66-26-5 Co-Cr-W	—	—	375 (4)	—	—	—	—	—
	—	13 Cr	13 Cr	—	200	250	Gr 1 IS : 7806-1975	12 Cr 13 IS : 1570 (Part 5)-1972	12 Cr 13 IS : 6603-1972
CR 13 and Cu-Ni	13 Cr	13 Cr	13 Cr	250 (5)	200	250	Gr 1 IS : 7806 - 1975	12 Cr 13 IS : 1570 (Part 5)-1972	12 Cr 13 IS : 6603-1972
	Cu-Ni	—	—	175 (5)	—	—	Manufacturer's Standard with 30 percent Nickel *Min*		
Cr 13 and HF	13 Cr	13 Cr	13 Cr	300 (5)	200	250	Gr 1 IS : 7806-1975	12 Cr 13 IS : 1570 (Part 5)-1972	12 Cr 13 IS : 6603-1972
	66-26-5 Co-Cr-W	—	—	350 (5)	—	—	—	—	—
Ni-Cu	Ni-Cu Alloy	Ni-Cu Alloy	Ni-Cu Alloy	Manufacturer's Standard			NiCu29Mn1513Fe IS : 4131-1967	—	—
18-8	18-8 Cr-Ni	18-8 Cr-Ni	18-8 Cr-Ni	Manufacturer's Standard			Gr 3 IS : 7806-1975	04Cr18Ni10 IS : 1570 (Part 5)-1972	04Cr18Ni10 IS : 6603-1972

Note 1 — Castings not applicable to trim material.

Note 2 — For austenitic trims, the back seat may alternatively be a weld deposit of the same nominal material composition as the trim or a welded on hardfacing. For hardfaced (HF) trim, the back seat may alternatively be a welded on hardfacing.

Note 3 — Body and disc seating surfaces. 250 HB minimum, with a minimum differential hardness of 50 HB between disc and body seat surfaces.

Note 4 — Differential hardness between disc and body seat surfaces is not mandatory.

Note 5 — Differential hardness between disc and body seat surfaces shall be manufacturer's standard.

7.8 *Gasket*

7.8.1 The body bonnet joint gasket may be any one of the following:

a) Spiral wound stainless steel with asbestos filler,

b) Soft iron,

c) Single or double jacketed asbestos, and

d) Ring joint.

7.8.2 The material of the gasket shall be suitable for the service conditions and for the pressure/temperature rating of the valve.

7.9 *Bolting*

7.9.1 The body/bonnet joint bolting shall conform to IS : 5517-1978 Specification for steel for hardening and tempering' Gr 40 Cr 4 Mo 3 studs with IS : 1570 (Part 2)-1979 Specification for carbon steel (unalloyed steel)' Gr 45 C 8 or 55 C 8 nuts or equivalent. If any other bolting material is required, the same shall be specified in the purchase order.

7.9.2 Unless otherwise specified in the purchase order, material for gland and yoke bolting shall be steel of at least 430 N/mm^2 tensile strength. Free-cutting carbon steels shall not be used.

7.10 *Bellows* — Bellows material shall be selected such that the maximum service temperature is below the creep range.

Note — Typical material for bellows are as follows:

a) Stabilized austenitic chromium-nickel steel (titanium stabilized),

b) Austenitic chromium-nickel-molybdenum steel (2½ percent molybdenum),

c) Unstabilized austenitic chromium-nickel steel,

d) Stabilized austenitic chromium-nickel steel (niobium stabilized)

e) NA 16 nickel-iron-chromium-molybdenum-copper alloys, and

f) NA 14 nickel-chromium-iron alloy.

7.11 *Handwheel, Handwheel Retaining Nut and Yoke Bush Nut*

7.11.1 Handwheel shall be of steel, malleable iron or nodular iron.

7.11.2 Handwheel retaining nut and yoke bush nut shall be of material having melting point above 955°C.

7.12 *Name Plate* — Its material shall be corrosion resistant to the manufacturer's standard.

8. Operation of Gate or Globe Valve

8.1 Unless otherwise specified in the purchase order the valve shall be direct handwheel operated.

8.2 If chainwheel operation is required, the type of the chainwheel shall be as specified in the purchase order. If chain is also required, its length shall be specified in the purchase order.

8.3 If power operation is required, the type of power and power unit and the design maximum pressure differential across the valve shall be as specified in the purchase order.

9. Inspection and Tests

9.1 Each valve shall be pressure tested in accordance with IS : 6157-1981 'Specification for valve inspection and test (*first revision*)' except for bellows seal valves, where the hydrostatic shell and seat pressure shall be as specified in Table 3 or 1·5 times (for the shell) or 1·1 time (for the seat) respectively the manufacturer's bellows rating whichever is the lesser. Bellows shall be tested in accordance with **9.2**.

9.2 *Type Test for Bellows* — The bellows shall be fatigue tested either by cycling a completely assembled valve head assembly, or in a rig in which the bellows attachments simulate the actual design installation.

Prior to the cycling test, a hydraulic pressure test shall be carried out in accordance with **9.1** of this standard.

The frequency of cycling is not to exceed one cycle per second.

One complete cycle shall consist of movement of the bellows from the designed compressed condition to the design extended condition and back to the designed compressed condition.

Cycling shall be carried out at ambient temperature and at the corresponding rated pressure.

A minimum of three bellows of each size and type shall be cycled to a minimum number of:

a) 10 000 cycles, for globe valves; and

b) 2 000 cycles, for wedge gate valves.

The bellows shall be subjected to NDT examination on completion of the minimum number of cycles and shall show no sign of cracking.

9.3 General inspection of the valve shall be as specified in IS : 6157-1981.

10. Marking — The valves shall be marked as specified in IS : 9866-1981 'Specification for marking system for valves .

10.1 *Certification Marking* — Details available with the Bureau of Indian Standards.

11. Coating

Unmachined exterior surfaces of the shell shall be painted with heat resistant aluminium paint except austenitic steel valves which shall not be painted. Valves which have already been given a coat of parkerising or phosphatising need not be painted.

Machined or threaded surfaces shall be coated with an easily removable rust preventive. The stem is not required to be coated if the stem packing contains a sacrificial metal corrosion inhibitor.

12. Shipment

The valves shall be dried and cleaned thoroughly after testing. The valves shall be shipped in closed position, glands fully packed and all openings properly closed. End flanges and/or welding ends shall be blanked over their entire surface with bolted or steel strapped wood, fibre plastic or metal or other suitable covers (not smaller than the raised face diameter of the flange) properly secured against opening. The end protector can also be securely attached to the valve end by suitable friction lending devices. Covers shall be of such design that the valve cannot be installed without removal of protector cover. Any tappings shall be protected with thread protectors.

The valves shall be shipped individually or collectively in a manner to prevent shifting within the package. Shipping of loose valves is not recommended and if done, it will be the risk of the manufacturer, who will replace the same if any valve is damaged during transit.

13. Guarantee

The manufacturer shall by acceptance of the purchaser s order, guarantee the material, the design and the operation of the valves covered by the order to the extent, that if any defect attributable to faulty workmanship, design or material are faced in the valves within a period of one year after they are placed in the regular service or 18 months (whichever is less) from the date of receipt of the valves, the manufacturer will furnish free of charge at the original point of delivery, any part or parts thereof that prove defective, provided the valves have not been misused or abused and have been installed in service for which they are recommended. If any valve is found to be defective prior to placement in service, the same shall be replaced by the manufacturer free of cost.

14. Information to be Supplied by the Purchaser along with Enquiry or Order

a) Types of valve required are:

   1) wedge gate,

   2) globe (straight, angle or oblique pattern) and

   3) check valve (straight or angle) for horizontal or vertical use.

b) Class designation, nominal size, standard or reduced bore.

c) End connections:

   1) If flanged ends are required, state type of facing required;

   2) If butt welding ends are required, state particulars of the pipe or wall thickness and outside diameter of the pipe; and

   3) If screwed ends are required, state form of thread required.

d) Whether a particular form of disc is required.

e) The shell material and the trim material.

f) The bellows material (*see* **7.10**).

g) Special material requirements for valves in highly corrosive environments or for low temperature service.

h) Type of operation requirement.

j) Any additional marking.

k) Test certificates.

APPENDIX A

(*Note* 2 *under Table* 9)

COMPARATIVE STUDY OF STANDARDS

	Material Type	**Specification**		
		ASTM	BS	IS
CASTINGS	Carbon steel	A-216 Gr WCB	1504-161 Gr B	2856-1979 Gr 2
	Carbon steel (Low temperature)	A-352 Gr LCB		1570-1979 25C8
	1/2 Mo steel (Low temperature)	A-352 Gr LCI		4899 Gr 4
	1 Cr 1/2 Mo steel	A-217 Gr WC 6	1504-620	3038 Gr 4
	2·1/4 Cr 1 Mo steel	A-217 WC 9	1504-622	3038 Gr 5
	5 Cr 1/2 Mo steel	A-217 Gr C5	1504-625	3038 Gr 6
	18 Cr-8Ni (AISI 304)	A-351 Gr CF8	1504-304 S 40 (1504-885)	7806 Gr 3
	18 Cr-10 Ni-2Mo (AISI 316)	A-351 Gr CF8	1504-316 S 40 (1504-885)	7806 Gr 5
	18 Cr-8Ni-Nb (AISI 347)	A-351 Gr CF8C	1504-347 S 40 (1504-821 Gr Nb)	7806-Gr 5A
	Carpenter alloy	A-296 Gr CN7M		3444 Gr 15
	3½ percent Ni steel	A-352 Gr LC3	1504-503/1510-LT 100	4899 Gr 3
FORGINGS	Carbon steel	A-105/A-181 Gr F1	1503-161 Gr C	2004 Gr 3 1875 Gr 3
	Carbon steel (Low temperature)	A-350 LF 2		1570-1979 15 C8
	1 Cr 1/2 Mo steel	A-182 Gr F12	1503-620	2611-1964 15 Cr 70 Mo 55
	2¼ Cr 1 Mo steel	AA-182 Gr F22	1503-622	1570-1979 10 Cr 2 Mo 1
	5 Cr 1/2 Mo steel	A-182 Cr F5A	1503-625	1570-1979 20 Cr 5 Mo 55
	3½ percent Ni steel	A-350 Gr LF3	1503-503/1510-LT 100	1570-1979 15 Ni 14 Cr 3 Mo12
	18 Cr-8 Ni (AISI 304)	A-182 Gr F304	1504-304 S 48	1570-1979 04 Cr 19 Ni 9
	18 Cr-10Ni-2Mo (AISI 316)	A-182 Gr F316	1504-316 S 40 (1504-845)	1570-1979 04 Cr 18 Ni 11 Mo 2
	18 Cr-8Ni-Nb (AISI 347)	A-182 Gr F347	1504-347 S 40 (1504-821 Gr Nb)	1570-1979 04 Cr 19 Ni 9 Nb 40
	18Cr-8 Ni-Ti	A-182 Gr F321	1504-321 S 40 (1504-821 Gr Ti)	1570-1979 04 Cr 19 Ni 9 Ti 20

Note — Materials used shall be subjected to heat treatment procedure required by the corresponding material specifications.

EXPLANATORY NOTE

In the preparation of this standard, considerable assistance has been derived from BS 5352 : 1981 Specification for steel wedge gate, globe and check valves 50 mm and smaller for the petroleum, petrochemical and allied industries , issued by the British Standards Institution.

Example:

A successful test of DN 50, class 300 valve will qualify the following valves:

a) DN25 and DN40 valves of classes 150 and 600.

b) DN80 and DN100 valves of classes 150 and 600.

c) DN25, 40, 80 and 100 valves of class 300.

d) DN50 valves of classes 150, 300 and 600.

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